This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. (currently amended) An imaging apparatus comprising:

a container for a liquid;

a transmitter for transmitting wavefield energy into the liquid and a tissue appendage of a body of a mammal;

a device holding the tissue appendage stationary relative to the liquid in the container;

a receiver to receive wavefield energy transmitted through the liquid and the tissue appendage; and

an image renderer to process the received wavefield energy in an inverse scattering parabolic propagation step to render therefrom an image of the tissue appendage.

2. (canceled)

3. (original) The imaging apparatus as defined in claim 1, wherein the receiver receives incident wavefield energy that has been transmitted:

from the transmitter into the liquid in the container;

from the liquid in the container into the device for holding the tissue appendage;

from the device for holding the tissue appendage into the tissue appendage;

from the tissue appendage into the device for holding the tissue appendage;

from the device for holding the tissue appendage into the liquid; and

from the liquid to the receiver.

4. (original) The imaging apparatus as defined in claim 1, wherein the device is assisted by pressure in holding the tissue appendage stationary relative to the liquid in the container.

5. (original) The imaging apparatus as defined in claim 1, wherein the device for holding the tissue appendage reduces movement of the tissue appendage relative to the liquid in the

container during movement of the body of the animal.

6. (original) The imaging apparatus as defined in claim 1, wherein:

the liquid is water;

the tissue appendage is a breast; and

the animal is a human.

7. (original) The imaging apparatus as defined in claim 1, wherein the device includes a membrane that covers a surface on the tissue appendage.

8. (canceled.)

9. (currently amended) The imaging apparatus as defined in claim ~~8~~ 1, wherein:

the wavefield energy that is received by the receiver has both a wavelength in the liquid and a corresponding wavefield frequency component in the liquid;

the inverse scattering parabolic propagation step that is accelerated in speed by employing a computational pixel size that is greater than one half of the wavelength of the corresponding wavefield frequency component.

10. (original) The imaging apparatus as defined in claim 9, wherein the inverse scattering parabolic propagation step is implemented by using a short convolution operation.

11. (original) The imaging apparatus as defined in claim 10, wherein the short convolution operation is a discrete convolution which is faster if done by direct summation rather than by a Fast Fourier Transform (FFT).

12. (original) The imaging apparatus as defined in claim 9, wherein the inverse scattering parabolic propagation step is implemented by using an FFT.

13. (currently amended) The imaging apparatus as defined in claim ~~2~~ 1, wherein:

the wavefield energy that is received by the receiver is transmitted from the transmitter and has a wavelength in the liquid in the container corresponding to a corresponding maximum temporal frequency; and

the image renderer performs an inverse scattering parabolic propagation step that is accelerated in speed by employing a computational pixel size that is greater than one half of the wavelength of the corresponding maximum temporal frequency.

14. (currently amended) The imaging apparatus as defined in claim ~~2~~ 1, wherein:

the image of the tissue appendage has a plurality of image components;

the wavefield energy that is received by the receiver is transmitted from the transmitter:

has a wavelength in the liquid in the container corresponding to a corresponding maximum temporal frequency; and

is discretized by a plurality of points each being separated from other said points by an average spatial separation;

the image renderer performs imaging method which totally or partially uses wave equation modeling, wherein:

the wave equation modeling utilizes a nonlinear operator relating an inversion data to the plurality of image components;

the inversion data is a transformation of the received wavefield energy and is within the range of the nonlinear operator;

the domain of the nonlinear operator is the image components;

the imaging method uses an arithmetic operation which computes the received wavefield energy on a set of surfaces given the wavefield energy on another, disjoint set of surfaces using a parabolic differential equation in the derivation of the arithmetic operation; and

the imaging method is accelerated in speed by employing the average spatial separation of the points to be greater than one half the wavelength in the liquid.

15. (original) The imaging apparatus as defined in claim 14, wherein the imaging method is implemented by using a short convolution operation.

16. (original) The imaging apparatus as defined in claim 15, wherein the short convolution operation is a discrete convolution which is faster if done by direct summation rather than by a Fast Fourier Transform (FFT).

17. (original) The imaging apparatus as defined in claim 14, wherein the imaging method is implemented by using an FFT.

18. (currently amended) A breast imaging apparatus comprising:

a water tank;

means for immobilizing a breast surface relative to water in the water tank, wherein the breast surface is contiguous with the body of a mammal;

means for irradiating the breast surface with wavefield energy;

means for receiving the wavefield energy; and

means for processing the received wavefield energy to render an image of tissue beneath the breast surface <u>by performing an inverse scattering parabolic propagation step</u>.

19. (original) The breast imaging apparatus as defined in claim 18, wherein the means for immobilizing a breast surface is assisted by pressure in holding the breast surface in and stationary to the water in the water tank.

20. (original) The breast imaging apparatus as defined in claim 19, wherein:

the means for immobilizing a breast surface includes a membrane that covers the breast surface; and

the pressure is applied to the membrane.

21. (currently amended) The breast imaging apparatus as defined in claim ~~19~~, wherein:

the wavefield energy that is received by the receiver is transmitted from ~~the~~ <u>a</u>

transmitter~~; and~~

~~the means for processing the received wavefield energy to render an image of tissue beneath the breast surface performs an inverse scattering parabolic propagation step.~~

22. (original) The breast imaging apparatus as defined in claim 21, wherein:

the wavefield energy that is received by the receiver has both a wavelength in the liquid and a corresponding wavefield frequency component in the liquid;

the inverse scattering parabolic propagation step that is accelerated in speed by employing a computational pixel size that is greater than one half of the wavelength of the corresponding wavefield frequency component.

23. (original) The breast imaging apparatus as defined in claim 19, wherein:

the wavefield energy that is received by the receiver is transmitted from the transmitter and has both a wavelength in the water and a corresponding wavefield frequency component;

the means for processing the received wavefield energy to render an image of tissue beneath the breast surface performs an inverse scattering parabolic propagation step that is accelerated in speed by employing a computational pixel size that is greater than one half of the wavelength in the water of the corresponding wavefield frequency component.

24. (original) The breast imaging apparatus as defined in claim 22, wherein the inverse scattering parabolic propagation step is implemented by using a short convolution operation.

25. (original) The breast imaging apparatus as defined in claim 24, wherein the short convolution operation is a discrete convolution which is faster if done by direct summation rather than by Fast Fourier Transform (FFT).

26. (original) The breast imaging apparatus as defined in claim 22, wherein the inverse

scattering parabolic propagation step is implemented by using a FFT.

27. (currently amended) A method of imaging a mammalian breast appendage, the method comprising:

immobilizing a mammalian breast appendage in a liquid bath relative to the liquid bath;

irradiating the liquid bath and the mammalian breast appendage with wavefield energy;

receiving at a receiver a received wavefield energy that is transmitted through both the liquid bath and the mammalian breast appendage; and

using the received wavefield energy to render an image of the mammalian breast <u>using an inverse scattering parabolic propagation step</u>.

28. (canceled).

29. (currently amended) The method as defined in claim ~~28~~ <u>27</u>, wherein:

the received wavefield energy has a wavelength in the liquid bath and a corresponding wavefield frequency component; and

the inverse scattering parabolic propagation step is accelerated in speed by employing a computational pixel size that is greater than one half of the wavelength in the liquid bath of the corresponding wavefield frequency component.

30. The method as defined in claim 27, wherein the mammalian breast appendage is immobilized in the liquid bath by a pressure applied to a surface of the mammalian breast appendage.

Claims 31-35 (canceled.)

36. (new) An imaging apparatus comprising:

a container for a liquid;

a transmitter for transmitting wavefield energy into the liquid and a tissue appendage of a body of a mammal;

a device holding the tissue appendage stationary relative to the liquid in the container;

a receiver to receive wavefield energy transmitted through both the liquid and the tissue appendage;

an image renderer to process the received wavefield energy to render therefrom an image of the tissue appendage; and wherein:

the image of the tissue appendage has a plurality of image components;

the wavefield energy that is received by the receiver is transmitted from the transmitter:

has a wavelength in the liquid in the container corresponding to a corresponding maximum temporal frequency; and

is discretized by a plurality of points each being separated from other said points by an average spatial separation;

the image renderer performs imaging method which totally or partially uses wave equation modeling, wherein:

the wave equation modeling utilizes a nonlinear operator relating an inversion data to the plurality of image components;

the inversion data is a transformation of the received wavefield energy and is within the range of the nonlinear operator;

the domain of the nonlinear operator is the image components;

the imaging method uses an arithmetic operation which computes the received wavefield energy on a set of surfaces given the wavefield energy on another, disjoint set of surfaces using a parabolic differential equation in the derivation of the arithmetic operation; and

the imaging method is accelerated in speed by employing the average spatial separation of the points to be greater than one half the wavelength in the liquid.